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ABSTRACT

Helping students understand coherence in terms of the lexical ties and semantic relations possible between clauses and sentences formalizes an area of writing instruction that has been somewhat vague before and makes the process of creating a coherent paragraph less mysterious. Many students do not have the intuitive knowledge base for absorbing the relations possible between sentences, nor can the readings of one composition course supply them with such knowledge. They need the support of conscious rules. With several systems available for classifying semantic relations between clauses, the composition teacher should find one offering as clear and complete an explanation of connections as possible. A symmetrical arrangement of paired connections between sentences provides a rationale whereby students realize how sentences can follow one another and why some transition words are virtually necessary for coherence. One such system delineates both positive relations and negative or reversed relations between sentences. The negative relations are processed more slowly, suggesting their usefulness in signaling or helping readers across an unexpected or difficult "synapse" between clauses. (Seven classifications of positive transitions and seven classifications of reversed transitions are discussed, with examples of their use provided.) (RL)

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Semantic and Lexical Coherence

Most composition texts present coherence, the flow of meaning from sentence to sentence, as the by-product or result of paragraph organization according to some model of development. This approach is certainly sensible since by definition a paragraph is ideally a set of sentences that belong together or cohere. With a model for a paragraph in mind, a writer is more likely to order sentences correctly than if he or she had no such plan.

But what models of paragraph development will suffice for a student? And, more fundamentally, can every possible satisfactory paragraph be subsumed under a set of models? We can teach paragraph organization according to the modes. We can talk about inductive, deductive and pivoting paragraphs, or expository paragraphs in A.L. Becker's TRI and PS paradigms. We can even use Christensen's view of paragraphs as coordinate or subordinate sequences of sentences. Indeed some books talk about all these patterns. But none of these models or even sets of models is comprehensive enough to cover the vast variety of paragraphs that make up comprehensible, satisfactory prose. The very notion of imposing such models of paragraph development has recently come under attack.[1]

Explaining coherence as a function of the entire paragraph seems to be based on the assumption that a reader can absorb a paragraph all at once, as though it were a two-dimensional diagram and the reader had a bird's-eye view. While it is likely that a

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paragraph once read is translated into a structurally-related set of sentences, it is not taken in that way in the first place. Instead, paragraphs are read linearly, in time, clause by clause. If we think first of paragraphs as series of sentences or clauses that must be taken in one by one, then at the most basic level, coherence is a matter of getting from one sentence to the next without irretrievably losing the meaning. How the gap or "synapse" between clauses is bridged is of crucial importance.[2] At higher levels, coherence is a matter of seeing relationships between groups of sentences and even paragraphs. This paper, however, will deal with the first level, sentence-by-sentence coherence, and only touch on the other levels.

On the problem of coherence between individual sentences, the literature available to composition teachers is rich. Richard Larson suggested that the "roles" of individual sentences in relation to each other could be precisely described, and he offered a list of seventeen of these roles.[3] W. Ross Winterowd, focusing on the synapse between clauses, identified seven possible relations that can exist between them in a coherent discourse; he proposed these as the basis of a "grammar of coherence."[4] More recently, William Stalter suggested essentially the same seven relationships (four simple and three combined).[5] Finally, the most complete study of the sources of coherence between two clauses or sentences is the work of the British linguists M.A.K. Halliday and R. Hasan, Cohesion in English (London: Longman, 1976). All these theorists attempt to explain how two sentences sensibly follow one another. Their contributions can be synthesized and, with some modifications, used in the composition classroom.

The work of the linguists Halliday and Hasan is the fullest introduction to how sentences or clauses stick to one another. According to them, two sentences cohere if some element in one sentence cannot be understood without recourse to the other; such reference is usually anaphoric, looking back to a preceding sentence, but can occasionally be cataphoric, looking forward. Halliday and Hasan find five basic sources of this cohesion: reference, substitution, ellipsis, lexical cohesion and conjunction.[6] Conjunction actually comes fourth in the sequence of chapters which Halliday and Hasan devote to each source of cohesion, but in their final summary it is significantly left to last.

> Conjunction is rather different in nature from the other cohesive relations, from both reference, on the one hand, and substitution and ellipsis on the other. It is not simply an anaphoric relation. Conjuntion elements are cohesive not in themselves but indirectly, by virtue of their specific meanings; they are not primarily devices for reaching out into the preceding (or following) text, but they express certain meanings which presuppose the presence of other components in the discourse" (Halliday and Hasan, p. 226).

Thus in this fifth category, Halliday and Hasan move from the lexicogrammatical sources of cohesion to an essentially semantic source, though as linguists they focus exclusively on lexical items in the surface structure of sentences. For their operative word "conjunction" was may read the more familiar word "transition." Their analysis of conjunctive devices amounts to a scrupulous classification of transition words and phrases under four main headings: the additive, adversative, causative and temporal, the

general categories of semantic relations between sentences. Their system seems to differ from Winterowd's and Stalter's, each of whom finds seven basic relations. But actually all these schemes overlap considerably. Halliday and Hasan simply place some distinctions in subclasses (i.e. both addition and alternation under Additive) which the others give co-prominece. These differences are not really disturbing for as the linguists admit, "There is no single, uniquely correct inventory of the types of conjunctive relation; different classifications are possible, each of which would highlight different aspects of the facts" (Halliday and Hasan, p. 238).

Transition words undoubtedly embody the semantic relations between successive clauses. But Halliday and Hasan's "conjunctions" or Winterowd's "transitions" are not dependent on lexical items in the surface structure of sentences. We can speak of the exact relation of one sentence to the one immediately preceding it even though that relation is not signalled by a co-ordinating or subordinating conjunction or adverb. Winterowd did notice that transitions could be expressed or implied, and Halliday and Hasan admit the same possibility; ". . . we are often prepared to recognize the presence of a relation of this kind [conjunctive] even when it is not expressed overtly at all. We are prepared to supply it for ourselves, and thus assume that there is cohesion even though it has not been explicitly demonstrated" (Halliday and Hasan, p. 229). The presence of nameable semantic relations in the absence of transition words is a fundamental principle of coherence, yet it is rarely emphasized or even mentioned in composition texts. It is nevertheless the necessary assumption behind the

advice usually given about putting in transition words; explicit semantic markers cannot be added unless the connections they represent are inherently present between two clauses.

With several systems of semantic relations between clauses to choose from, the composition teacher should find one which offers as clear and complete an explanation of connections as possible and yields good advice about achieving coherence. I find a somewhat full accounting of the relations useful. I also see the adversative or negative transitions in quite a different way from that of other theorists. The following is a list of the positive relations that can exist between sentences. I give examples of each relation in both its marked and unmarked form. All examples are taken from Carl Sagan's The Dragons of Eden: Speculations on the Evolution of Human Intelligence (New York: Random House, 1977); a single author was used to demonstrate that these connections are the resource of any one writer and not rare examples only to be found by searching the work of many different authors.

(1) Sequence: The simplest possible relation is time order, the relation which links sentences in a narrative or set of instructions. The order of the two sentences suggests the order of the two actions or events or states they specify. Were the order of any two temporally-related sentences switched, the reader would invert the sequence of the actions.

> Marked: "The monkey pressed the appropriate light and, in the case of a correct guess, was rewarded with a pellet of food. Then the time interval between hearing the sound and seeing the light was increased up to twenty seconds."

Unmarked: "I once witnessed an experiment in which the head of a green bottle fly was connected by a very thin wire to an oscilloscope that displayed, in a kind of graph, any electrical impulses produced by the fly's olfactory system. The experimenters wafted a wide variety of odors in front of it, including obnoxious and irritating gases such as ammonia, with no discernible effects."

(2) Restatement: The second of two sentences or clauses in sequence can say essentially the same thing as the first, though in different words and usually in greater detail. A restatement may also say specifically what has just been said generally, or vice versa.

Marked: "Large organisms such as human beings average about one mutation per ten gametes--that is, there is a 10 percent chance that any given sperm or egg cell produced will have a new and inheritable change in the genetic instructions that determine the makeup of the next generation."

Unmarked: "Jacob Bronowski was one of a small group of men and women in any age who find all of human knowledge--the arts and sciences, philosophy and psychology--interesting and accessible. He was not confined to a single discipline, but ranged over the entire panorama of human learning."

(3) Exemplification: A sentence can be related to the immediately preceding one because it gives an example of the set introduced in the first. The relation of member to set seems close to but is actually fundamentally different from that of a specifying restatement to an original statement.

Marked: "Differences in group behavior--something that it is very tempting to call cultural differences--have been reported among chimpanzees, baboons, macaques and many other primates.

For example, one group of monkeys may know how to eat birds' eggs, while an adjacent band of precisely the same species may not."

Unmarked: "Where such communication is essential for survival, there is already some evidence that apes transmit extra-genetic or cultural information. Jane Goodall observed baby chimps in the wild emulating their mothers and learning the reasonably complex task of finding an appropriate twig and using it to prod into a termite's nest so as to acquire some of these tasty delicacies."

(4) Premise:[7] A second sentence can be related to the one before it as a reason, a cause, or generally a supporting statement. Many of the transition words which signal "premise here" pull a clause into dependency. When a dependent clause comes first in a sentence, the relation is cataphoric, looking forward to a coming clause, rather than anaphoric, looking back to a preceding clause or sentence.

Marked: "Jacob Bronowski and a colleague wrote a scientific paper denying the significance of Washoe's [A chimpanzee's] use of language because, in the limited data available to Bronowski, Washoe neither inquired nor negated."

Unmarked: "It is very difficult to evolve by altering the deep fabric of life; any change there is likely to be lethal."

(5) Conclusion: A second sentence or clause can follow as a consequence or inference from the one before it which is then a premise or supporting statement. The "conclusion-premise" or "Premise-conclusion" pairs are forms of enthymemes (one premise of the potential syllogism suppressed). The premise-conclusion pairs offered in the everyday logic of much writing cannot always be expanded into valid syllogisms, but they are intended by the

author and meant to be taken in by the reader as pairs of supporting and supported statements.

Marked: "When cultural and child-rearing biases are taken into account, there is not clear evidence of overall differences of intelligence between the sexes. Therefore, brain-mass differences of 150 grams in humans must be unimportant."

Unmarked: "After the extinction of the dinosaurs, mammals moved into daytime ecological niches. The primate fear of the dark must be a comparatively recent development."

(6) Similarity: The second of two sentences or clauses can make a point analogous to the one before it.

Marked: "Lucy was eventually able to distinguish clearly the meanings of the phrases 'Roger tickle Lucy' and 'Lucy tickle Roger,' both of which activities she enjoyed with gusto. Likewise, Lana extrapolated from 'Tim grooms Lana' to 'Lana groom Tim.'" [Lana and Lucy are chimpanzees.]

Unmarked: "On seeing for the first time a duck land quacking in a pond, Washoe gestured 'water bird,' which is the same phrase used in English and other languages, but which Washoe invented for the occasion. Having never seen a spherical fruit other than an apple, but knowing the signs for the principal colors, Lana, upon spying a technician eating an orange, signed 'orange apple.'"

(7) Addition: This is the weakest of the abstract relations between sentences. A second sentence or clause can follow the one before it simply as another point, another thing to be said. This "next thing" must bear some relation to the preceding point, as for instance another item in a series, but it is never as close as a similar point.

Marked: "There is in the neocortex a striking separation of

function, which is contrary to such common-sense notions as that reading and writing, or recognizing words and numbers, are very similar activities. There are also as yet unconfirmed reports of brain damage that results only in the inability to understand the passive voice or prepositional phrases or possessive constructions."

Unmarked: "We know from skeletal remains associated with early man that our ancestors were hunters. We know enough about the hunting of large animals to realize that some language is required for cooperative stalking."

Students can easily test for an unmarked relationship between two sentences by trying to fit in one of the following transition words: restatement--that is; exemplification--for example; premise--because; conclusion--therefore; similarity--similarly; and addition--also.

But the most common transition words have yet to be accounted for. Where do "yet" and "but" and "however" fit in the scheme? Winterowd groups these transition words into an "obversative" category, and Halliday and Hasan into one called "adversative." But instead of being grouped together as though they stood for the same logical relationship between clauses, the connections represented by the various "negative" transition words should be distinguished from each other and seen in quite a different relation to the semantic connections already established.

The relations of restatement, example, premise, conclusion, similarity, addition and even the basic sequential relation can be thought of as the positive or normal connections between sentences, the kind of open, "go-ahead," more predictable synapses. In a sense each of these positives has an opposite partner, a distinct

relation that reverses in a way the logic of the connection; statements can defy rather than be concluded from a previous clause, they can exist as exceptions rather than examples, as contrasting rather than similar points. The semantic relations between clauses can be seen then as coming in opposed pairs: restatement--differentiation; example--exception; premise--concession; conclusion--contradiction; similarity--contrast; addition --alternation; and even sequence--anomalous sequence. The opposition expressed in each of these pairs is unique.

Research in memory and comprehension has shown that negative statements and information are processed more slowly than positive.[8] We can extrapolate from the experimental conclusions to the hypothesis that if the second of a pair of statements is in any way a reversal of the first, it will not be comprehended as readily.[9] Thus the reversed relations are usually signalled to help a reader across an unexpected synapse or turn in the meaning. Pairing the possible relations then is particularly useful because it provides a rationale for using transition words.

Here are definitions and examples of the reversed relations, again all from Sagan's Dragons of Eden.

(1) Differentiation: Instead of restating, the second of two clauses or sentences can make a point intended to replace or be differentiated from the first. One of these sentences will often contain a negative; if it is the second, the transition word may be omitted. (It is x; it is not y. Or, It is not y; instead it is x.)

> Example: "In such rehearsals [of major symphony orchestras] the conductor does not often start from the beginning and run through to the end. Rather, because of the expense of rehearsal time as well as the competence of the performers, he

concentrates on the difficult passages." (The second sentence in this example contains a premise as well.)

(2) Exception: If the first of two sentences establishes a set, the second can exclude something from that set.

Example: "[I]t was said, microcephalics have some, although severely impaired, use of language--while apes have none. But in only relatively few cases are microcephalics capable of human speech."

(3) Concession: The second of two clauses or sentences may acknowledge an apparent if not real contradiction from the first, or it may qualify the first. A premise supports, but a concession detracts, though its point is usually blunted (as in this example). Concessions are usually relegated to dependent clauses.

Anaphoric example: "The most elaborate man-made device of this sort, the gas chromatograph/mass spectrometer, has in general neither the sensitivity nor the discriminative ability of the bloodhound, although substantial progress is being made in this technology."

Cataphoric example: "Although the devisers of the Stanford-Binet test consider such questions of geometric conception to be very useful in determining the 'intelligence' of children, they are said to be increasingly less useful in IQ tests of teenagers and adults."

(4) Contradiction: A conclusion is supported by the clause or sentence which precedes it, but a contradiction is maintained despite the preceding statement. It is asserted even though it apparently contradicts the previous point. In formal logic, contradictory statements cannot both be true or both be false; nevertheless this common pairing appears to defy logic. A contradiction can be inter-

changed with a concession just as a conclusion can be with a premise (e.g. "Although it is raining you can go out today," and "It is raining; nevertheless, you can go out today.")

Example: "But we have been preceded by an awesome vista of time, extending for prodigious periods into the past, about which we know little--both because there are no written records and because we have real difficulty grasping the immensity of the intervals involved. Yet we are able to date events in the remote past."

(5) Contrast: Rather than pointing a similarity, the second in a pair of clauses or sentences can oppose the previous statement. A contrasting statement does not have to oppose the entire preceding one; instead, it can offer a contrary to only one element.

Example: "Nocturnal animals, such as the mammals of the time, and deep-sea animals, such as fish, could have survived this higher ultraviolet intensity; but daytime animals that lived on land or near the surface of the waters would have been preferentially destroyed."

(6) Alternation: The second of two sentences or clauses can offer a choice which would exclude the first. Alternation is perhaps not strictly the reversal or opposite of addition. Yet to say "x or y" is quite different in everyday logic from saying "x and y," as anyone knows who has ever been confronted with the possibility of two desserts.

"Likewise adolescent gorillas, who have little to fear, nevertheless construct nests each night--perhaps because they evolved from more vulnerable predecessors. Or perhaps, once, the ancestors of lions and gorillas feared still more formidable predators."

(7) Anomalous Sequence: Whenever simple sequence is the implicit connection between two sentences, time transition words are not necessary. But whenever any anomaly in time order exists between two sentences or clauses, an explicit transition word is necessary, and the language is filled with words and phrases to signal the more complex time relationships of simultaneity (e.g. "meanwhile"), going backwards in time (e.g. "before"), and hurrying forward in some unpredictable way (e.g. "five years later").

> Example: "While older macaques, set in their ways, ignored her, the younger monkeys appeared to grasp the importance of her discovery, and imitated it. In the next generation, the practice was more widespread; today all macaques on the island are competent at water sifting, an example of cultural tradition among the monkeys."

A symmetrical arrangement of paired connections between sentences provides a rationale that students grasp easily about how sentences can follow one another and about why some transition words are virtually necessary for coherence (see Table I). Students can ask themselves, "What kind of connection do I have between these sentences? If the connection is a reversal, should I help my reader across the synapse with a transition word?" The emphasis in this kind of questioning is on the writer's responsibility to the reader; the goal of clarity is in part achieved by marking those relations the reader would find difficult to follow. Ann O. Gebhard has shown convincingly that professional writers use significantly more transition words in their carefully edited and certainly readable prose than do inexperienced college writers.[10]

While some transition words serve basic clarity, others, especially those which mark a positive relation, are tools of

Table I: The Paired Semantic Relations and Some Common Transition Words That Can Signal Them

Sequence	Restatement	Exemplification	Premise	Conclusion	Similarity	Addition
POSITIVE RELATIONS						
then next	that is in other words in short	for example for instance thus	because since for given	therefore hence so consequently thus then	likewise similarly	and also moreover furthermore in addition too finally
Anomalous Sequence	**Differentiation**	**Exception**	**Concession**	**Contradiction**	**Contrast**	**Alternation**
REVERSED RELATIONS						
earlier much later meanwhile	rather instead		even though although though granted	nevertheless	on the other hand on the contrary conversely	or otherwise
15	(----------but----------yet----------however----------)*					16

*These three words can signal several relations. They are perhaps general reversal markers; other transition words are specialized.

emphasis instead. Most readers easily see the relation of an example to a preceding sentence, but signaling that relation with a "for example" or "for instance" doesn't hurt. It is also often desireable to emphasize a similarity with a "likewise," etc., and since a conclusion can be an important thing to stress, conclusion indicators like "therefore" often surface.

In only one other relation is the presence of a transition word ostensibly mandatory rather than optional. The additive, "here's another thing" connection is, as pointed out, the weakest possible. If for any reason the writer has a series of these unmarked additions, the sense of coherence seems to slip by the time the reader reaches the third or fourth sentence. An "also," "moreover," or "furthermore"--words which are always available to emphasize an addition--seem almost essential before the third or fourth in a series of merely added together sentences.[11] Parallelism is another device in the writer's repertoire for strengthening the coherence between merely added together clauses and sentences.

The following paragraph, the second from a Scientific American article, "The Social Ecology of Coyotes" by Marc Bekoff and Michael C. Wells, illustrates how sentences can be connected in a coherent series according to the semantic relations identified so far. The anaphoric relations are named in brackets between the sentences; the sole complex sentence contains an internal cataphoric relation.

> It is generally accepted that most animal characteristics are the product of an interaction between inherited predispositions and environment. [Restatement ←] In other words, although [Concession] the cumulative passing of the genes by successfully reproducing individuals establishes certain tendencies in

each animal, many observable traits are subject to modification by proximate, or immediate, factors in the animal's environment. [Conclusion] Thus many of the animal's traits, in particular behavioral ones, can be viewed as adaptations to the environments in which the animal has lived or is living. [Exemplification] For example, the Dutch ethologist Hans Kruuk, who has done intensive studies of hyenas, has concluded that for many large carnivores, which typically have few predators (other than man), the nature of food resources is an important proximate factor that influences social behavior. [Restatement] More precisely, it appears that variations in the sociality of carnivores of the same species can often be traced to differences in their food supply.

(April, 1980, p. 130)

This is a rare example of a paragraph which marks every connection. That it is so "overdetermined" is no doubt a function of the authors' consideration of audience, of the place of this paragraph early in their article, and of the fact that it is made up of many long, involved sentences. Far more common is the paragraph which leaves most of the positive relations between sentences implicit and marks only to emphasize or to signal reversals.

Government job creation and salvation has been proceeding for a decade in Massachusetts and other states: not only CETA programs and statewide subsidies for public-sector jobs but also state-level counterparts of the Chrysler approach. [Restatement] Sustaining the illusion that big companies are a prime source of new jobs, state officials often engage in an unseemly and self-defeating competition of blandishments for big business, giving them subsidies and tax exemptions, and even iisuing bonds to construct their plants. [Contradiction]

> Yet all the money to finance the make-work, and all the subsidies and exemptions for large firms, finally must be raised by increasing the tax burden on smaller businesses--on the source of new employment for the future. [←Conclusion] Job subsidies thus can end up destroying jobs. [←Restatement] The paradox of job creation is that any job requiring a subsidy may diminish total employment by eroding the capital that is needed to create and sustain productive work.
>
> George Gilder, "The Make-Work Economy," Harper's (November 1979), p. 43.

Do marked or unmarked relations always exist between any two sentences in a coherent discourse as they do in the examples above? Both Ross Winterowd and William Stalter seem to suggest that they do, though they leave the proof to their readers. I have not found that all contiguous clauses or sentences in professional prose are related by one of the connections listed above. Nor do I find that the absence of a classifiable semantic relation is necessarily a sign of incoherence, as it would be all too easy to say by defining coherence as the presence of a nameable relation. Although the set of relations given here could be incorrect or inadequate or both,[12] it seems instead that another kind of coherence may hold sentences together, and we must return to the other sources of cohesion noted by Halliday and Hasan. Thus when a nameable semantic relation is missing between two sentences, other sources of cohesion can take over and, if they are strong enough, carry the reader across a logical gap between two sentences; that is, some clear reference, substitution, repetition of a key word, etc., can in a sense inform readers that the sentence they are now reading is indeed connected to the one before it even though no obvious semantic relation links them. Sometimes then lexical cohesion alone

may be present, though it is well known that a string of only lexically-tied sentences can form an incoherent series. Conversely, the semantic relation supplied by a transition word can make two sentences seem to cohere when no other source of cohesion is present (e.g. "Alfred broke the chair because the weather changed"). But normally of course, both semantic and lexical cohesion tie together clauses in a discourse.

We can then teach our students two sources of coherence, semantic and lexical. The paired semantic relations have already been outlined; here, following but altering somewhat the work of Halliday and Hasan, is a simplified list of the sources of lexical cohesion. Again, all the examples come from The Dragons of Eden.

(1) Repetition of words:

"The world as perceived through the R-complex was quite a different world. Because of the accretionary nature of the evolution of the brain, R-complex functions could be utilized or partially bypassed but not ignored."

(2) Use of synonyms or synonymous phrases:

"The fear of falling seems clearly connected with our arboreal origins and is a fear we apparently share with other primates. If you live in a tree, the easiest way to die is to forget the danger of falling."

(3) Use of words from the same semantic field: The term "semantic field" may seem unnecessarily formal, but students find the concept behind it easy to grasp. The best way to introduce it is with the psychologists' association game: i.e. "If I say 'doctor' what comes to your mind?" The non-idiosyncratic words that come to mind (nurse, hospital, medicine, operation) are words in the same semantic field.

"There is no way to explain the discontinuous appearance of stone tools unless the (Australopithicenes) had (educational) institutions. There must have been some sort of stonecraft guild passing (knowledge) about fabrication and use of tools--knowledge that would eventually propel such feeble and almost defenseless (primates) into domination of the planet Earth."

[These two sentences are also rich in synonyms and repeated words.]

(4) Use of pronouns of clear reference: In this category I would include "one" and "same" which Halliday and Hasan see as participating in substitution rather than reference. ("Reference" is based on recovering meaning from the environment which is usually but not always the text; a "substitution" is instead a "sort of counter which is used in place of repetition of a particular item," see Halliday and Hasan, p. 89). Their classification is undoubtedly correct from the linguist's point of view, but from the student's it seems an over-refinement.

"At the age of three, my son (Nicholas) was asked for the earliest event he could recall and replied in a hushed tone while staring into middle distance, 'It was red, and I was very cold.' (He) was born by Caesarean section."

(4) Use of Pointing Words: Although Halliday and Hasan include these under the categories of demonstrative and comparative reference, I find it useful to distinguish the words in this category from the personal pronouns since they are such a strong source of lexical cohesion and since students tend to mis- or insufficiently use them. The indispensable pointing words are "such," "this," "that," "these," "those," and sometimes "the."

"Accidentally useful mutations provide the working material for biological evolution--as, for example, a mutation for

melanin in certain moths, which changes their color from white to black. Such moths commonly rest on English birch trees, where their white coloration provides protective camouflage."

(6) Ellipsis:

"Then every billion years of Earth history would correspond to about twenty-four days of our cosmic year, and one second of that year [would correspond] to 475 real revolutions of the Earth about the sun."

The sources of cohesion that linguists find when they analyze a passage "in tranquility" may not have the same importance as the sources of coherence that work for a reader who is plunging straight-forward through a series of sentences. The semantic relations between sentences seem to be more important than the lexical when we consider what the psycholinguists tell us goes on when sentences are comprehended. According to research summarized in Herbert and Eve Clark's Psychology and Language (New York: Harcourt Brace Jovanovich, 1977), the working or short-term memory for prose is very limited in capacity and quickly dumps the exact wording of a sentence. What is retained instead is the gist.[13] As they put it, listeners and readers "...build an interpretation from verbatim wording, but then get rid of this wording soon after crossing the sentence boundary, leaving only the interpretation" (p. 139). If readers retain only the semantic interpretation of whatever sentences they have read, then their comprehension of many sentences must consist of a series of such interpretations organized or related in some way; the semantic relations identified here, marked or unmarked, can fill in this part of a model for the comprehension process.

The two sources of cohesion then, lexical and semantic, do not seem to be of equal value so far as coherence is concerned. Mere lexical cohesion simply relates two sentences topically but does not advance the meaning of a paragraph, and any paragraph which is only a string of four or five lexically-tied sentences taxes a reader's attention. The gap between sentences connected only by lexical cohesion or by the semantic relation supplied solely by a transition word can be called a <u>partial discontinuity</u>. Should both lexical and abstract cohesion be absent, the result is <u>total discontinuity</u>, and considerable confusion.

Partial discontinuities are common in the prose of magazines and newspapers where bits of information are often added together and paragraphing is a matter of format. Here is an example of a paragraph with partial discontinuities, from the news-like "Science and the Citizen" section of <u>Scientific American</u>. This is the last paragraph in a summary of a report issued by the World Health Organization (WHO). A slash [/] marks the partial discontinuities.

> (1) Cancer, until recently a serious public-health concern only in the developed countries, is also beginning to be a major cause of sickness and death in underdeveloped countries, such as China, where infectious and parasitic diseases are being brought under sontrol. / (2) The actual prevention of cancer is never likely to be easy, the WHO report points out; (3) [$\overleftarrow{\text{Premise}}$] (4) [$\overrightarrow{\text{Concession}}$] even when a direct-acting risk factor is identified, eliminating it may call for changing deep-seated cultural habits. (5) [$\overleftarrow{\text{Exemplification}}$] "Excessive exposure to sunlight is now recognized as the cause of much of the skin cancer that occurs in Caucasians, (6) [$\overleftarrow{\text{Contradiction}}$] but discouragement of sunbathing is an unpopular measure."

(7) [←Addition] The most clearly implicated risk factor is cigarette smoking, which significantly increases the risk not only of lung cancer but also cancers of the larynx, esophagus, and bladder (as well as bronchitis, emphysema and coronary heart disease); (8) [←Exemplification] it is estimated to be responsible for more than 40 percent of all male cancer deaths in the United Kingdom./ (9) Another recent WHO publication argues that cigarette smoking should be considered a pandemic, "since smoking is an unnatural form of behavior, resulting in impaired well-being and often in severe illness, and is spread throughout the world by a process of psychological contamination." (January, 1981, p. 82)

The discontinuities in this paragraph are only partial because of the lexical cohesion which carries readers over synapses without semantic relations. Between sentences two and one, for example, the word "cancer" is repeated and words from the same semantic field are chosen, i.e. "public health" and "prevention." Similarly, between sentences nine and eight, "another," "WHO publication," "cigarette smoking," "pandemic," and "severe illness" are lexical connectors reaching into earlier sentences in the paragraph.

The semantic relations that we have identified between sentences can operate simultaneously on two or three other levels as well: within the sentence, between individual clauses and sentences, between sets of sentences and even between paragraphs. Identifying <u>levels</u> of structure by using the same set of relationships again and again gives us a new way of talking about so incredibly complex an entity as a paragraph.

The following paragraph from a <u>Harper's</u> article shows three levels of structure.

(1) Job "guarantee" and "creation" programs deny the under-

standing that all jobs are to some extent created by the worker. (2) [←Restatement] Whether a bricklayer or a magazine editor, a janitor or an actress, a corporate executive or an assembly-line worker, only the job-holder can finally guarantee the job, by the act of supplying labor, undergoing hardship, achieving distinction, engendering profit, however small, thus becoming part of the struggle by which human life improves itself. (3) [←Conclusion] In this effort, obstacles, such as discrimination, early rejection, or even bankruptcy, often elicit higher achievement, impelling the worker to find or invent for himself a new task, or a new company. (4) [←Exemplification] (5) [Anomalous Sequence→] When Boeing teetered near collapse in the early 1970s and laid off thousands of workers, few observers saw that event as a boon for Seattle. (6) [←Contradiction] Yet laid-off Boeing workers and technicians started scores of small businesses--from electronics firms and solar panel factories to an importer of specialty coffees for the entire West Coast. (November 1979, p. 45)

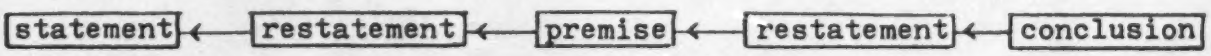
We can look first at the relations embedded in individual sentences. Although sentences one and two say roughly the same thing ("jobs are to some extent created by the worker" and "only the job-holder can finally guarantee the job"), sentence 2 contains examples of job holders and a premise supporting the main clause (i.e. "by the act..."). In the same way, sentence 3 provides examples of "obstacles" and restates what is meant by "higher achievement" (i.e. finding or inventing a new task or company). The last sentence also embeds examples of the new small businesses begun as a consequence of Boeing's decline.

The relations on the second level, between units punctuated

as sentences, are named in brackets. At one level above this, we can see a structure made up of three units. Sentences 1 and 2 constitute a single premise, repeated twice. Sentence 3 is the conclusion from the premise, and all the rest makes up a third unit which illustrates the paradoxical process of job impediments leading to the creation of new jobs. At the level of sentence groups then, the structure of the paragraph is premise--conclusion --example. How such sentence groupings combine to form paragraph structures, some of which are the familiar models of paragraph development, is work for further analysis.

Aside from the fascination of the study of coherence in itself, of what use is it in the composition classroom? First of all, attention to immediately adjacent sentences, to their connections both lexical and abstract, can help students in the revision process. When they go over a paragraph by analyzing the connections between sentences, they are more likely to detect such problems as misuse of a transition word, failure to mark a reversed relation, or an illogical ordering of sentences.

Second, the semantic relations between sentences can also be used to generate a paragraph. Students can be given a string of possible relationships between a set of five or six sentences and a first sentence from which these others are to branch. They can then create a paragraph to fulfill the paradigm. The initial sentence may be something like, "Most Penn State students don't study efficiently" which is to sit at the head of a paradigm such as the following:



Most Penn State students don't study efficiently. Their study time is generally wasted on the trivial instead of

focusing on selected, important material. This habit is not the fault of the student as much as of the background the student has received. Throughout high school, students were tested on specifics while whole concepts were ignored and finding causal connections between lessons was not emphasized. This kind of background leads the PSU student to work more on individual assignments without relating those assignments to the course as a whole and understanding the concepts that are taught.

Or, with a different opening,

[statement]←[restatement]←[exception]←[restatement]←[conclusion]←[premise]

Most Penn State students have come to college to prepare themselves for a specific job. They see the university as a large vocational high school training them for careers in technical fields. But a few students see Penn State differently. These students come here for a broadening education rather than narrow training. They often have difficulty deciding on a major as the university demands. They are too interested in too many things and not ready to settle down.

These paragraphs are candidates for stylistic revision and sentence combining, but at least they are coherent. Fill-in-the-paradigm exercises like these are not recommended as a step in the composing process; rather, such exercises simply strengthen the student's ability to generate one sentence from another.

Helping students understand coherence in terms of the lexical ties and semantic relations possible between clauses and sentences formalizes an area of composition instruction that has been somewhat vague before. It makes the process of creating a coherent paragraph less mysterious. Undoubtedly the well-read writer (well

read in reasoned prose particularly) has absorbed the relations possible between sentences and can intuitively reproduce them. Many of our students, however, do not have this intuitive base, nor can the reading provided in a single composition course supply it. They need the support of conscious rules.

The particular view advocated here of paired semantic relations has an important by-product. It emphasizes and restores to their proper importance the discriminating aspects of thought, the processes of differentiating, excepting, conceding, or contrasting by which thinking, and the prose which represents thinking, is carried on. Far from being "illogical," as Christensen classified them, paragraphs with turns, with transition words like "but" and "however," represent the disentangling and teasing apart of meanings and sets and premise-conclusion pairs by which thought and prose travel somewhere.

Footnotes

[1]C.H. Knoblauch, New York University, "Some Formal and Nonformal Properties of Paragraphs and Paragraph Sequences," Paper delivered at CCCC, March, 1981.

[2]The word "synapse" is borrowed from physiology to label the juncture between two clauses. A synapse is the point of contact between two neurons across which messages are transmitted in one direction; it is, therefore, an apt word to describe the gap between two sentences across which the meaning must travel in one direction.

[3]Richard L. Larson, "Sentences in Action: A Technique for Analyzing Paragraphs," College Composition and Communication, 18 (1967), 16-22.

[4]W. Ross Winterowd, "The Grammar of Coherence," College English, 31(1970), 828-835.

[5]William Stalter, "A Sense of Structure," College Composition and Communication, 29 (1978), 341-345.

[6]Reference to May, 1981, CCCC articles on Halliday and Hasan.

[7]I have found that in identifying semantic relations between unmarked clauses, students often confuse the premise and restatement. This confounding is surely predictable, however, when we remember how the syllogism has been criticized for circularity; sometimes indeed a second premise is from one point of view only a rewording of the conclusion (e.g. "Socrates is mortal because he is a man," and "Socrates is mortal; that is, Socrates is a man"). Many more unmarked relations between clauses may be semantically ambiguous, but most are not.

[8]See for instance Carl I. Hovland and Walter Weiss, "Transmission

of Information Concerning Concepts Through Positive and Negative Instances," Journal of Experimental Psychology, 45(1953), 175-182; P.C. Wason, "The Processing of Positive and Negative Information," Quarterly Journal of Experimental Psychology, XI(1959), 92-107 (see espeically the discussion, pp. 102-107); Margaret Donaldson, "Positive and Negative Information in Matching Problems," British Journal of Psychology, 50(1959), 253-262; P.C. Wason, "Response to Affirmative and Negative Binary Statements," British Journal of Psychology, 52(1961), 133-142; Elizabeth R. Cornish and P.C. Wason, "The Recall of Affirmative and Negative Instances in an Incidental Learning Task," Quarterly Journal of Psychology, 22(1970), 109-114. The problem with generalizing from these studies is of course that they work with schematically simplified material, far from the complexity of ordinary prose.

[9]The assumption behind this model of comprehension is that each sentence in a sense raises expectations in the reader's mind about the set of sentences that can logically follow it; the positive relations fulfill expectation, or represent normal expectation; their opposites are less expected and therefore somewhat less comprehensible.

[10]Ann O. Gebhard, "Writing Quality and Syntax: A Transformational Analysis of Three Prose Samples," Research in the Teaching of English, 12(October 1978), see especially pp. 221-225.

[11]An example of a series marking the last addition from Sagan, The Dragons of Eden: "Many examples of a connection between 'right' and 'straight' can be found. In Mexican Spanish you indicate straight (ahead) by saying 'right right'; in Black American English 'right on' is an expression of approval, often for a sentiment eloquently or deftly phrased. 'Straight' meaning conventional, correct or proper